

Economic Dispatch: Concepts, Practices and Issues

Presentation to the Joint Board
for the Study of Economic Dispatch

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Overview

- What is economic dispatch?
- Planning for tomorrow's dispatch
- Dispatching the power system today
- Factors limiting the effectiveness of dispatch in minimizing customer costs
- Issues for consideration in the joint board report

What is economic dispatch?

- The definition of economic dispatch provided in EPCRA section 1234 is:

“The operation of generation facilities to produce energy at the lowest cost to reliably serve consumers, recognizing any operational limits of generation and transmission facilities.”
- Most electric power systems dispatch their own generating units and their own purchased power in a way that may be said to meet this definition.
- There are two fundamental components to economic dispatch:
 - Planning for tomorrow's dispatch
 - Dispatching the power system today

Planning for Tomorrow's Dispatch

- Scheduling generating units for each hour of the next day's dispatch
 - Based on forecast load for the next day
 - Select generating units to be running and available for dispatch the next day (operating day)
 - Recognize each generating unit's operating limit, including its:
 - Ramp rate (how quickly the generator's output can be changed)
 - Maximum and minimum generation levels
 - Minimum amount of time the generator must run
 - Minimum amount of time the generator must stay off once turned off
 - Recognize generating unit characteristics, including:
 - Cost of generating, which depends on:
 - its efficiency (heat rate)
 - its variable operating costs (fuel and non-fuel)
 - Variable cost of environmental compliance
 - Start-up costs
 - Next day scheduling is typically performed by a generation group or an independent market operator
- Reliability Assessment
 - Analyze forecasted load and transmission conditions in the area to ensure that scheduled generation dispatch can meet load reliably.
 - If the scheduled dispatch is not feasible within the limits of the transmission system, revise it.
 - This reliability assessment is typically performed by a transmission operations group

Dispatching the Power System Today

- Monitor load, generation and interchange (imports/exports) to ensure balance of supply and load
 - Monitor and maintain system frequency at 60 Hz during dispatch according to NERC standards, using Automatic Generation Control (AGC) to change generation dispatch as needed
 - Monitor hourly dispatch schedules to ensure that dispatch for the next hour will be in balance

- Monitor flows on transmission system
 - Keep transmission flows within reliability limits
 - Keep voltage levels within reliability ranges
 - Take corrective action, when needed, by:
 - Limiting new power flow schedules
 - Curtailing existing power flow schedules
 - Changing the dispatch
 - Shedding load

- This monitoring is typically performed by the transmission operator

Area Factors Limiting the Effectiveness of Dispatch in Minimizing Customer Costs

- Geographic area included

The size of the geographic region over which the dispatch occurs affects the level of costs: that is, which generation resources and which transmission facilities are considered in planning and economic dispatch.

- Generation resources included

Which generation resources in the area are included in the planning and economic dispatch, and whether they are included in the same manner, affects the level of costs.

- Transmission facilities included

What transmission facilities are included in the planning and economic dispatch, and how the reliability security limits of the transmission facilities are incorporated into the economic dispatch.

Implementation Factors Limiting Effectiveness of Dispatch in Minimizing Customer Costs

- Frequency of the dispatch

Performing an economic dispatch more frequently (e.g., 5 or 15 minutes rather than each hour) affects the level of costs.

- Communication of information

Generation operators, transmission owners, and load serving entities must provide accurate and current information to those performing the planning and dispatch functions.

Those performing planning and dispatch must provide accurate and current dispatch instructions to generation operators, transmission operators and load serving entities.

Inadequate or incomplete communications affects the level of costs of the economic dispatch.

- Software tools for dispatch and information

Reliable and secure computer software is essential for rapidly responding to system changes to maintain power system reliability, while selecting the lowest cost generators to dispatch.

Obsolete software affects the level of costs achieved by the economic dispatch.

- Coordination of dispatch across regions

Where there are multiple, independently performed, dispatches in a region, the effectiveness of coordination agreements and their implementation affect the level of costs of the economic dispatch.

Issues for Consideration in the Joint Board Report

- What is the current practice of economic dispatch in each region, and what is the scope of this dispatch?
- What improvements could be considered?
- What are the potential benefits and costs of those improvements?
- How would those improvements affect reliability?
- Are there institutional, regulatory, or statutory impediments to the identified improvements?